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WEEKLY CLIMATE BULLETIN

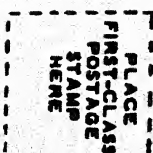
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GLOBAL CLIMATE HIGHLIGHTS

MAJOR CLIMATIC EVENTS AND ANOMALIES AS OF DECEMBER 18, 1993

1. Southwestern Alaska:

WET SPELL ENDS.

Less than 20 mm of precipitation was observed in the region as six-week moisture surpluses fell below 65 mm [WET - Ended at 8 weeks]

2. East-Central South America:

STILL ABNORMALLY WET.

As much as 110 mm of rain soaked Uruguay, northeastern Argentina, and extreme southern Brazil, allowing moisture excesses to approach 350 mm since early November at some locations in Uruguay and Argentina [WET - 9 weeks].

3. Europe:

PRECIPITATION BRINGS RELIEF.

Up to 100 mm of precipitation fell on parts of the United Kingdom, the Benelux Countries, Switzerland, and former Yugoslavia [DRY - Ended at 9 weeks].

4. Greece:

DRIER CONDITIONS PREVAIL.

Little or no precipitation fell on Greece for the second consecutive week, marking an end to unusually wet weather [WET - Ended at 8 weeks].

5. Southeastern Africa:

MORE HEAVY RAINS.

As much as 75 mm of rain drenched northeastern South Africa, southern Mozambique, and eastern Zimbabwe, where six-week moisture excesses approached 240 mm [WET - 7 weeks].

6. Southwestern Asia:

COLD WEATHER PERSISTS.

Temperatures averaged 4°C to 8°C below normal across much of Kazakhstan, with lows plummeting to -30°C at some locations [COLD - 9 weeks].

7. Western Japan:

HEAVY RAINS REPORTED ALONG WESTERN COAST; DRIER CONDITIONS ELSEWHERE.

Amounts below 30 mm fell across much of the region, but totals of 50 to 150 mm were observed along the western coast. Moisture surpluses declined in most areas, but remained near 225 mm at a few locations [WET - Ending at 8 weeks].

8. Taiwan:

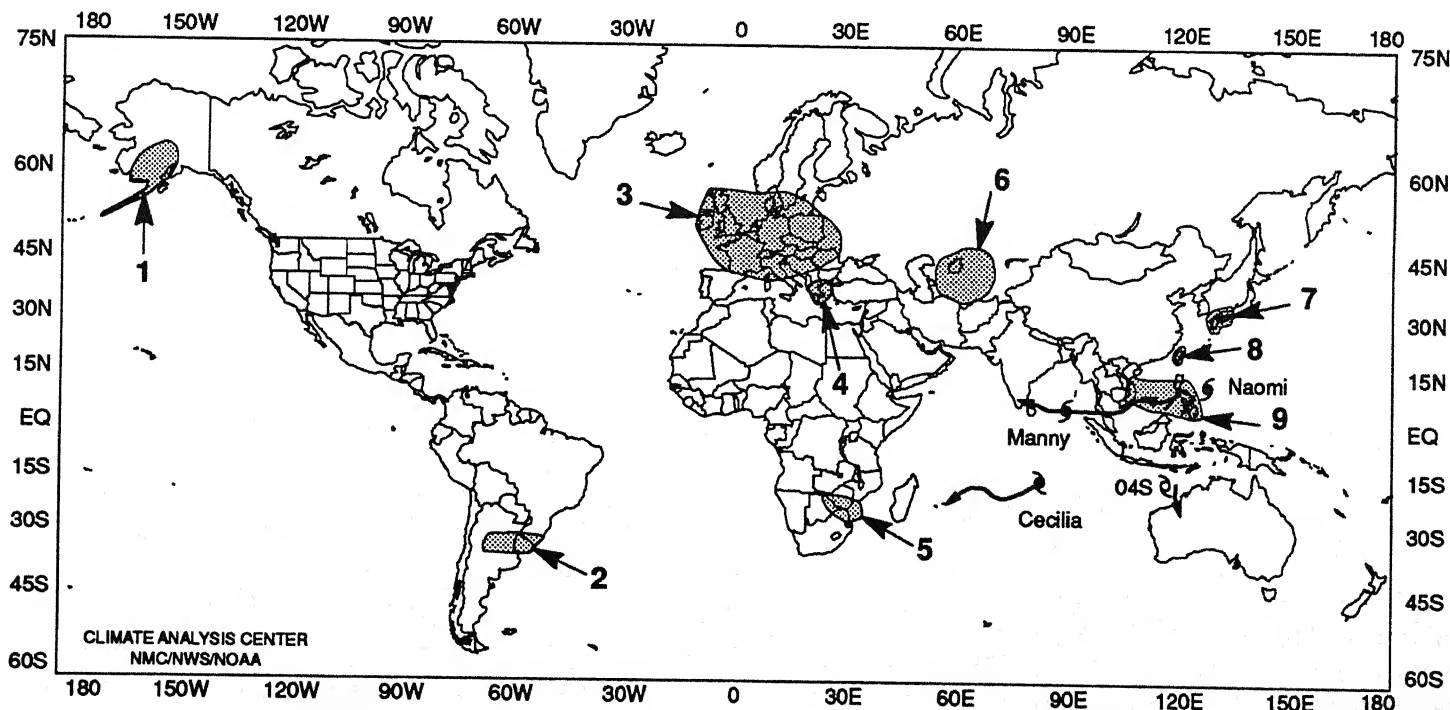
DROUGHT CONDITIONS CONTINUE.

Isolated showers dumped up to 245 mm on northeastern sections of the island, but most areas received less than 30 mm, and moisture shortages since early November ranged from 50 to 140 mm [DRY - 27 weeks].

9. Southeastern Asia:

STILL VERY WET.

Between 100 and 300 mm of rain fell on the central and eastern Philippines (some of which was associated with Typhoon Naomi) while amounts approached 100 mm across central Vietnam [WET - 4 weeks].



EXPLANATION

TEXT: Approximate duration of anomalies is in brackets. Precipitation amounts and temperature departures are this week's values.
 MAP: Approximate locations of major anomalies and episodic events are shown. See other maps in this Bulletin for current two week temperature anomalies, four week precipitation anomalies, long-term anomalies, and other details.

UNITED STATES WEEKLY CLIMATE HIGHLIGHTS

FOR THE WEEK OF DECEMBER 12 – 18, 1993

A pair of frontal systems pushed across the nation during the week. The first blanketed an area from the central Rockies eastward to middle Mississippi Valley with moderate to heavy snow and brought severe weather to the southern Plains and lower Mississippi Valley. On Sunday, the storm dumped up to two feet of heavy, wet snow on Utah, bringing down power lines and causing numerous traffic accidents, according to the Utah Highway Patrol. On Monday, violent thunderstorms ahead of the system produced wind gusts of up to 70 mph that downed power and phone lines in the eastern Texas panhandle and spawned a tornado that damaged several buildings in St. Rose, LA. On Wednesday and Thursday, the system moved northeastward off the middle and northern Atlantic Coast, generating heavy surf, coastal flooding, and beach erosion. The second frontal system dumped heavy precipitation on northern California on Tuesday, from the central Rockies northeastward to the northern Plains and upper Mississippi Valley on Thursday and Friday, and along the Texas Gulf Coast as the week ended.

At the beginning of the week, a large frontal system brought rain (snow in the higher elevations) and high winds across the central and southern portions of the Rockies and Great Plains. Elsewhere in the contiguous United States, precipitation was limited to scattered locations over northern New England and along the northern Pacific Coast. By Tuesday evening, the aforementioned system had pushed eastward to the southern Atlantic Coast, spreading snow from the central Plains into the upper Great Lakes and widespread rain over the southeastern Plains, the lower and middle Mississippi, Ohio, and Tennessee Valleys, and the Southeast. Farther west, a Pacific Ocean front moved inland, causing rain and gusty winds along the northern half of the Pacific coast on Monday and rain (snow in the higher elevations) along most of the Pacific Seaboard on Tuesday.

At mid-week, the low pressure area associated with the eastern frontal system tracked northeastward, generating heavy surf along the middle and northern Atlantic Coast and widespread precipitation over the mid-Atlantic, the Appalachians, upper Ohio and Tennessee Valleys, and New England. Meanwhile, the western frontal system moved eastward, causing scattered precipitation over the central and southern Intermountain West. During the latter part of the week, the eastern storm moved out to sea as the western frontal system continued to trek eastward. The storm's low pressure system moved northeastward, dumping heavy snow across the central Rockies and the northern and central Plains while showers developed ahead of the system's trailing cold front, bringing scattered rain to the southeastern Plains, the lower and middle Mississippi, Ohio, and Tennessee Valleys, and the

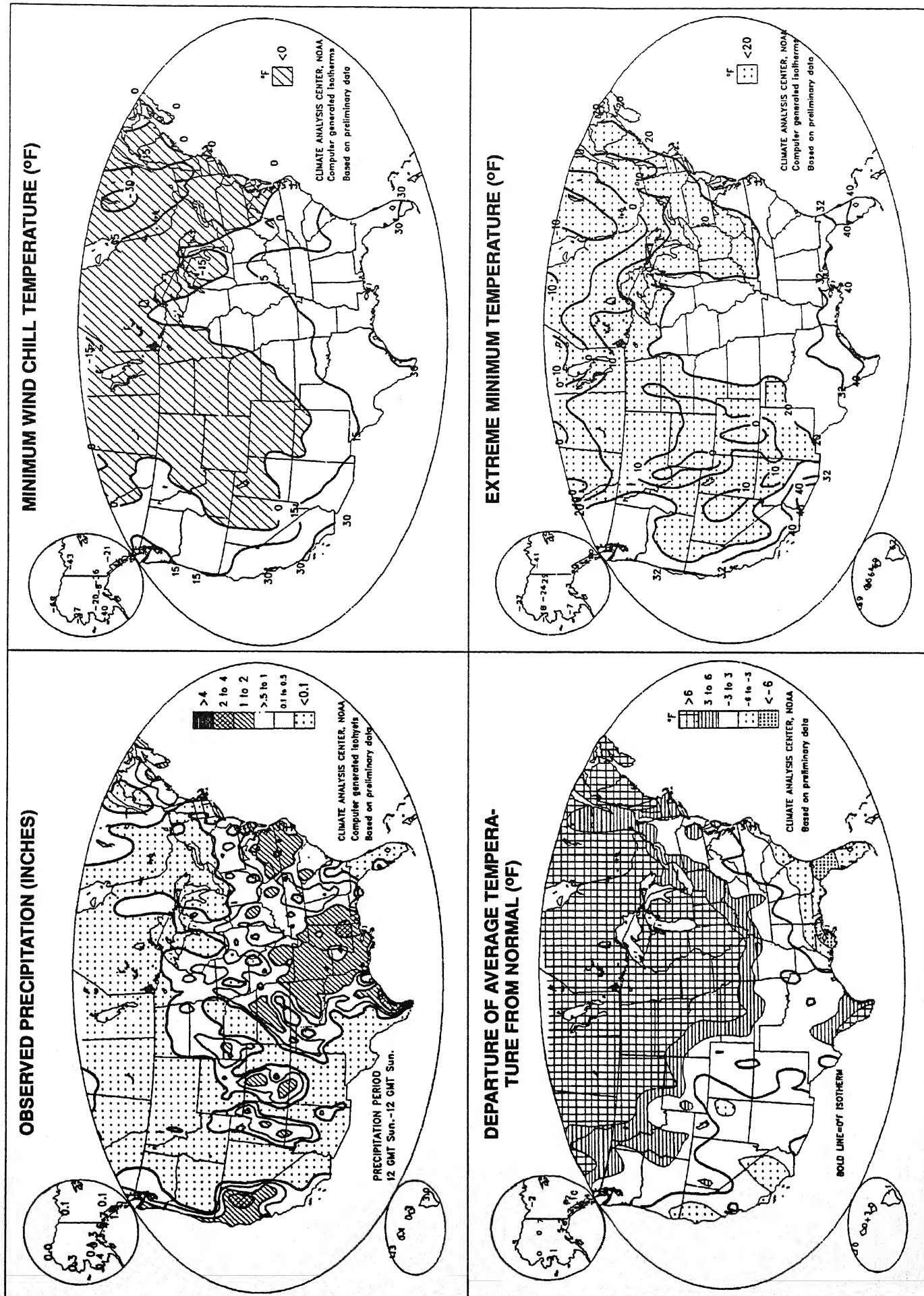
mid-Atlantic. At week's end, the system brought a mixture of sleet, rain, and snow to the upper Mississippi Valley and the Great Lakes, with heavy rain drenching parts of eastern Texas. Up to six inches soaked parts of the Texas Gulf Coast. In the West, rain moved into southern California ahead of another Pacific Ocean storm. To the north, gusty southeasterly winds warmed Anchorage, AK, to a daily record high of 46°F.

According to the River Forecast Centers, the greatest weekly precipitation totals (between two and six inches) fell across portions of southeastern Texas, southern Mississippi, and the northern Sierras. In addition, scattered totals exceeding two inches were reported across the central Rockies, the Southeast, the Ozark Plateau, the southeastern Plains, the Big Island of Hawaii, southeastern Alaska, and the remainders of the western and central Gulf Coast and northern California. Light to moderate amounts were measured in the Great Basin, the southern Intermountain West, the southern Rockies, western Alaska, and much of the remainders of the Far West, the central Rockies, the Great Plains, southern Alaska, Hawaii, and the eastern half of the nation. Little or no precipitation was reported in the northern Intermountain West, the northern Rockies, the northern High Plains, the middle Rio Grande Valley, the Florida Peninsula, portions of the Northeast, and northeastern and east-central Alaska.

Warmer than normal conditions prevailed over the Northwest, the Rockies, the Plains, the middle and upper Mississippi, Ohio, and Tennessee Valleys, the Great Lakes, the Appalachians, the mid-Atlantic, and the Northeast. Weekly departures of +6°F to +20°F were observed in the northern Rockies, the northern and central Plains, the middle and upper Mississippi and lower Rio Grande Valleys, the upper Great Lakes, and northern New England. Abnormally warm weather also dominated much of Alaska, with weekly departures reaching +10°F at Kenai. Temperatures averaged near to slightly above normal in central and western Hawaii.

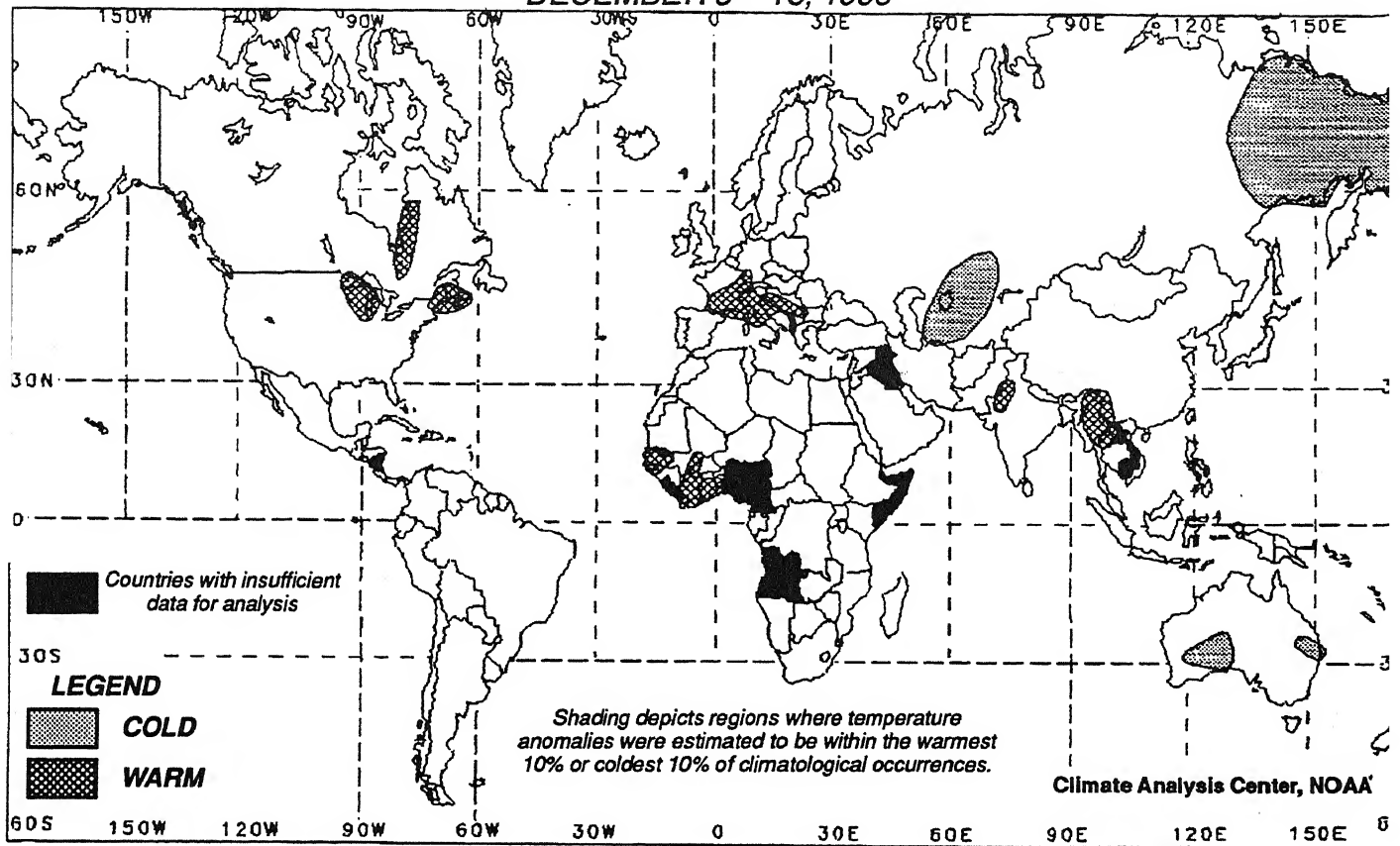
Below normal readings covered California, the Great Basin, the southern Intermountain West, and the central and eastern Gulf and southern Atlantic Coasts, with weekly departures ranging from -6°F to -7°F over the central Gulf Coast and the northern Florida Peninsula. Below normal readings were observed across extreme northern Alaska, and over portions of the east-central and southwestern sections of the state, with temperatures averaging 8°F below normal at Nenana. Temperatures also averaged slightly below normal on the island of Hawaii.

UNITED STATES WEEKLY CLIMATE CONDITIONS (December 12 – 18, 1993)



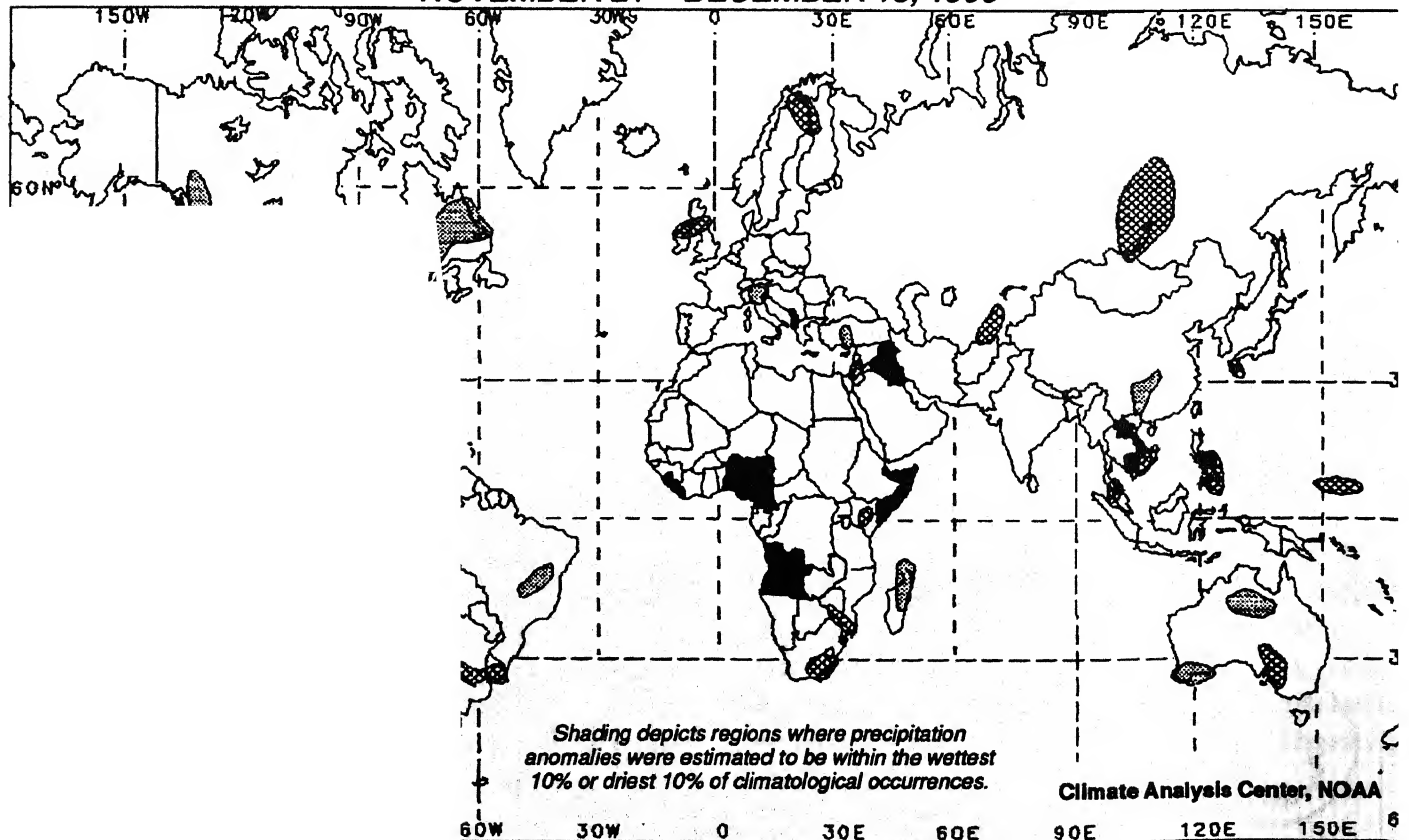
TWO-WEEK GLOBAL TEMPERATURE ANOMALIES

DECEMBER 5 – 18, 1993



FOUR-WEEK GLOBAL PRECIPITATION ANOMALIES

NOVEMBER 21 – DECEMBER 18, 1993



UNITED STATES SEASONAL CLIMATE SUMMARY

AUTUMN (SEPTEMBER – NOVEMBER) 1993

September opened with showers and thunderstorms covering much of the eastern two-thirds of the country while Hurricane Emily moved rapidly out to sea after buffeting the Outer Banks of North Carolina. A series of strong fronts ushered cold air into the northern two-thirds of the country, and near the middle of the month, the first major snowfall of the season whitened the northern and central Rockies. Subfreezing temperatures penetrated as far south as the central Rockies and central High Plains. To the east, relatively dry weather brought relief from the excessive summer wetness in the middle Mississippi Valley and the Corn Belt, but farther south, two weeks of intense thunderstorm activity dropped over 16 inches of rain on parts of the lower Mississippi Valley and south-central Plains. The occasional heavy rains caused flooding that swelled rivers and streams, forcing road closures in Missouri. Heavy rains and sporadic flooding persisted in the southern half of Missouri, southeastern Kansas, and northeastern Oklahoma until the end of the month, and serious flooding afflicted areas where levees damaged by the summer floods had not yet been repaired. Barge traffic was again halted along the Mississippi River just north of St. Louis because of high water and damaged levees. Elsewhere, heavy thunderstorms dropped up to eight inches of rain on parts of the south Atlantic Coast near mid-month, and severe thunderstorms spawned tornadoes in Texas and across the mid-Atlantic region as September drew to a close. Summer-like temperatures prevailed across much of the Far West early in September, and record highs were reported in the Southeast as the month drew to a close.

Repeated cold front passages dominated October, generating sharp day-to-day temperature contrasts. One particularly powerful system delivered up to a foot of snow to parts of Montana, Wyoming, western South Dakota, and the Nebraska panhandle. The system then displaced record-breaking warmth in the north-central states, bringing subfreezing temperatures as far south as the southern Rockies and High Plains, the middle Mississippi Valley, and the central Appalachians. Farther west, moderate to heavy rains deluged the southeastern Plains and southern portions of the Missouri, Mississippi, and Ohio Valleys while violent thunderstorms lashed Texas, eastern Kansas, western Arkansas, and eastern Oklahoma. In Alaska, the first major storm of the season brought high winds and heavy rains to southeastern sections of the state while ships in the Gulf of Alaska reported wind gusts to 109 mph. October came to a dramatic close as cold air plunged into the central states, producing dozens of daily record lows from the mountains of Wyoming to the Texas Gulf Coast. Early-season snow blanketed many states as far south as the southern Plains and the Tennessee Valley. Abilene and San Antonio, TX had the earliest snowfall on record while the four inches at Evansville, IN was the heaviest 24-hour snowfall amount on record for October. In sharp contrast, high pressure over Utah and corresponding low pressure over northwestern Mexico provided the dynamics for strong Santa Ana (easterly) winds in southern California, which whipped up numerous wildfires from north of Los Angeles southward to the Mexican border. An abundance of grasses from last Winter's heavy rains had dried out during the hot and dry summer, and combined with dead brush and timber from the previous long-term drought (1986–1992), provided ample fuel for the devastating fires.

Cold Canadian air plunged southward into the nation in early November and spread from the Intermountain West to the Atlantic Coast. Temperatures dipped below freezing across most of the eastern two-thirds of the country and plunged into the teens as far south as Arkansas. Dozens of new daily record lows were established as snow blanketed much of the lower Great Lakes, Ohio Valley, and Appalachians. Up to 19 inches buried north-central Pennsylvania. By mid-November, however, southerly flow brought unseasonably warm weather to the Southeast and East, with several locations setting new November high temperature records. After the brief warm spell, more cold air spilled southward across the Canadian border, preceded by strong storms that dumped four to nine inches of rain on portions of the middle Mississippi and Ohio Valleys. Severe weather erupted farther south as tornadoes touched down in Houston, TX and Harrodsburg, KY. Meanwhile, the Far West reported dry weather for the first three weeks of the month, especially during the first week, engendering a second round of fires. Hot and dry Santa Ana winds spread the fires rapidly across parts of southwestern California. According to press reports, nineteen major blazes consumed over 1,100 buildings, claimed three lives, injured about 200 people, scorched more than 200,000 acres, and caused an estimated \$1 billion in damage. When light rain finally fell on fire-denuded hills, the easily-dislodged soot, ash, and soil were carried down hillsides by runoff, engendering numerous mudslides. In late November, a

massive storm system brought blizzard conditions from the Pacific Northwest eastward to the upper Great Lakes and southeastward to the central High Plains. The storm dumped up to a foot of snow in the higher elevations of Montana and disrupted electrical power in the suburbs of Seattle. As the powerful storm trekked eastward, it disrupted Thanksgiving Eve travel through much of the nation's midsection as frozen or freezing precipitation spread throughout the Plains. Record low November temperatures occurred as Arctic air plunged southeastward to the Gulf of Mexico in the wake of the huge system. As the storm's eastward trek continued, it tapped tropical moisture and spread torrential rains and high winds across much of the East. Streams, creeks, and rivers in south-central Pennsylvania overflowed their banks as a result of four to eight inches of rain throughout the mid-Atlantic, much of which fell in one day. Farther north, wind gusts to 68 mph toppled trees, damaged buildings, and disrupted power in New England before the storm's slow-moving storm finally exited the United States. The end of the month featured heavy lake-effect snow in the Great Lakes region, with up to eight inches blanketing parts of eastern Wisconsin, extreme northeastern Illinois, northeastern Ohio, northwestern Pennsylvania, and western New York.

According to the River Forecast Centers, the greatest seasonal precipitation totals (up to 26 inches) were measured in the central states from southeastern Oklahoma northeastward to northern Indiana, and in southeastern Florida. Amounts exceeding a foot were observed throughout much of the nation from the Ozarks and lower Great Lakes eastward to the Atlantic Seaboard. In addition, more than twice the seasonal normal fell on parts of northern Arizona and the central High Plains, with greater than normal amounts also reported in parts of the Intermountain West and across most of the eastern half of the nation (page 6). Above normal autumn precipitation totals were also measured across Alaska, except for scattered areas in the south-central and southeastern parts of the state. Based on preliminary calculations from the National Climatic Data Center (NCDC), three of the nine regions reported above median amounts, with the Central Region experiencing its 8th wettest Autumn since records began in 1895 (page 7). Of the 48 contiguous states, 29 observed above median amounts, with Indiana, Missouri, and Pennsylvania reporting the first, second, and eighth wettest such season on record, respectively. A large number of tornadoes (169) touched down this season, making Autumn 1993 the fifth most active tornado season, based on preliminary reports. It should be noted that in the past the preliminary total overestimated the final count by 10% to 20% (page 10).

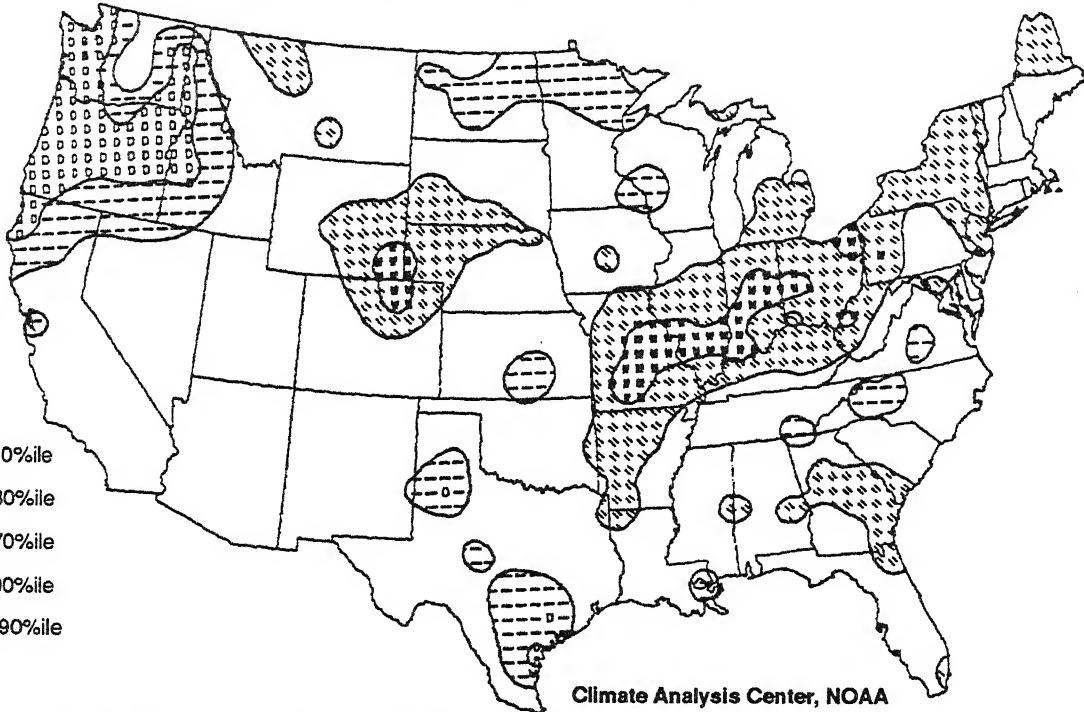
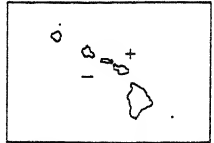
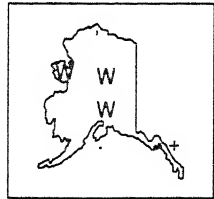
In sharp contrast, subnormal precipitation was reported across much of the Far West, the southern Great Plains, and the north-central states (page 6). Seasonal totals below two inches were measured in southern California, the Great Basin, the southern Rockies, and the northern High Plains, and unusually dry weather was also observed in Hawaii. Six of the nine NCDC regions reported submedian amounts, with the Northwest observing its 5th driest autumn in 99 years (page 8). Of the 48 contiguous states, 19 were drier than the 1895–1993 average, with Oregon, Washington, and North Dakota experiencing the 3rd, 4th, and 9th driest such season since records began in 1895. Despite relatively heavy precipitation in the Central and Northeast regions, the nation as a whole had the 35th driest autumn on record.

Temperatures averaged 2°F to 6°F below normal across most of the country from the Rockies eastward to the Appalachians, with the largest departures recorded in South Dakota and northern Nebraska (page 8). According to NCDC, eight of the nine regions experienced submedian autumn temperatures, with five regions in the center of the nation experiencing one of the nine coldest such seasons since records began in 1895 (page 9). Of the 48 contiguous states, 39 were colder than the 1895–1993 average, with Colorado reporting the coldest Autumn in 99 years of record. Five states (AR, KS, MI, MO, and OK) had the second coldest such season on record, and eleven others had seasonal mean temperatures among the ten coldest in the historical distribution. With abnormally cold weather dominating almost the entire United States, Autumn 1993 became the third coldest such season since records began in 1895.

Unusually mild weather was limited to the northern Sierra Nevada and southwestern Arizona, and the Carolina Coast, where departures approached +3°F (page 8). Above normal seasonal mean temperatures also prevailed across Alaska while near typical readings were recorded in Hawaii. Only one NCDC region, the Southeast, and nine states reported above normal autumn temperatures.

PRECIPITATION PERCENTILES

AUTUMN (SEPTEMBER – NOVEMBER) 1993



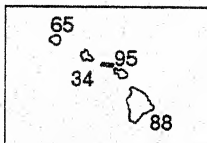
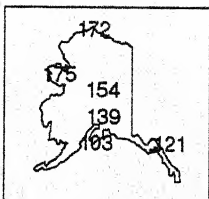
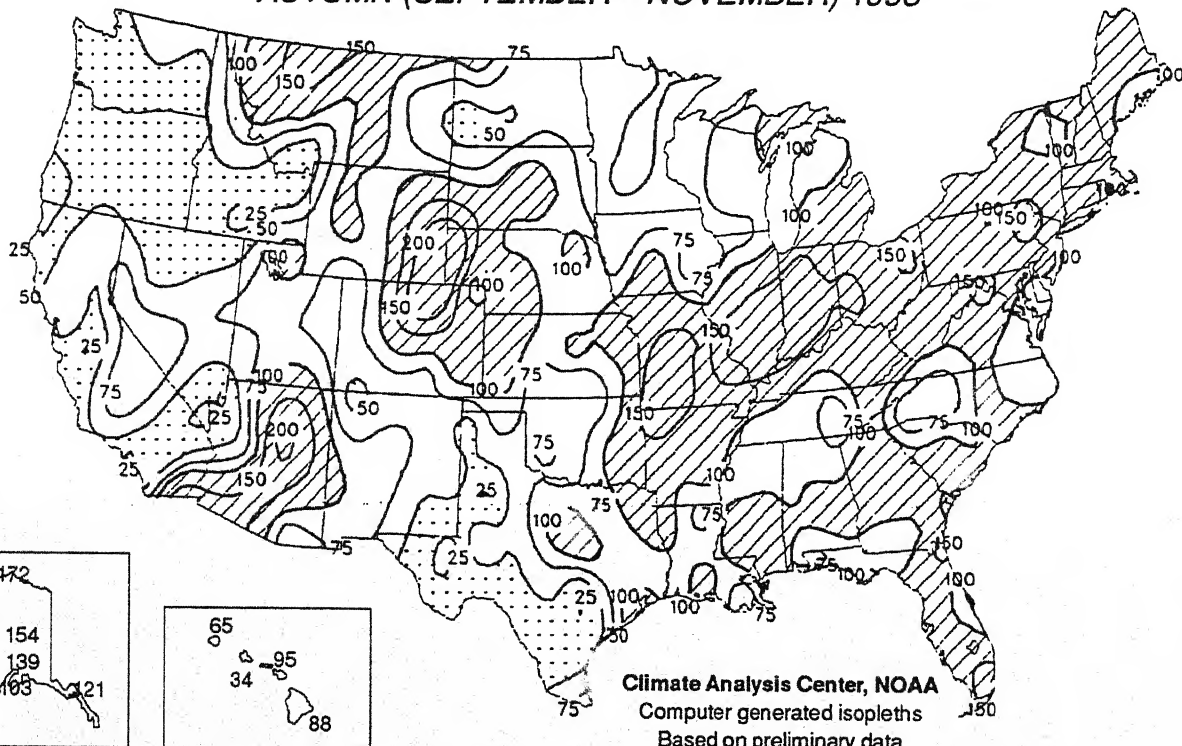
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Climate Analysis Center, NOAA

AUTUMN (SEPTEMBER – NOVEMBER) 1993 PRECIPITATION PERCENTILES, as computed by the Climate Analysis Center. A wet Autumn (>70%ile) was observed in the central High Plains, much of the Corn Belt, the Midwest, the eastern Great Lakes, and northern Maine. Totals were among the wettest 10% of the historical distribution in parts of Wyoming, Colorado, Missouri, Illinois, Indiana and Ohio. In contrast, climatologically significant dryness (<30%ile) prevailed in parts of North Dakota, Minnesota, Wisconsin, Texas and the Northwest, with seasonal totals among the lowest 10% on record in parts of the latter region.

PERCENT OF NORMAL PRECIPITATION

AUTUMN (SEPTEMBER – NOVEMBER) 1993

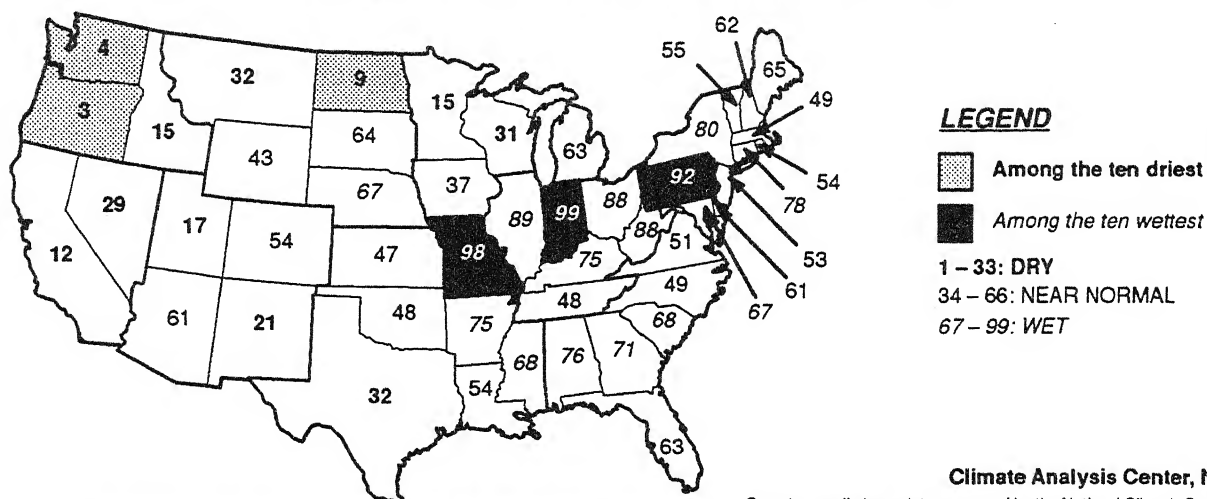


Climate Analysis Center, NOAA
Computer generated isopleths
Based on preliminary data

AUTUMN (SEPTEMBER – NOVEMBER) 1993 PERCENT OF NORMAL PRECIPITATION. Hatched areas received above normal precipitation, and dotted areas reported under half of normal. Above normal precipitation was observed in much of the eastern half of the country and in parts of the Rockies. Most of the Far West and parts of Texas and New Mexico, however, received under half of normal.

HISTORICAL PRECIPITATION RANKINGS BY STATE

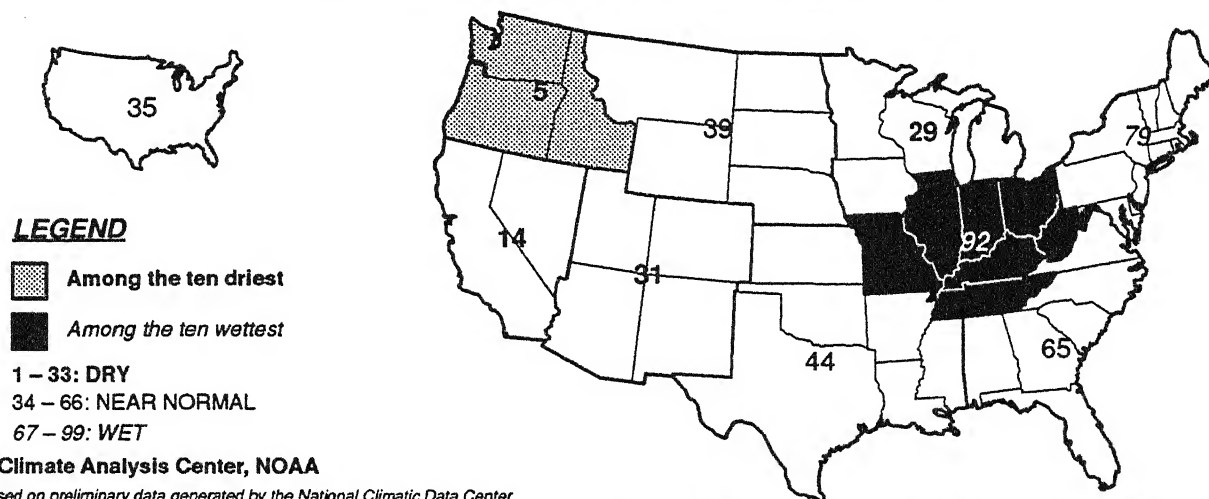
AUTUMN (SEPTEMBER – NOVEMBER) 1993



This chart depicts the ranking of the specific parameter, as measured during the period indicated, with respect to all other such periods on record since 1895.

HISTORICAL PRECIPITATION RANKINGS BY REGION AND NATION

AUTUMN (SEPTEMBER – NOVEMBER) 1993

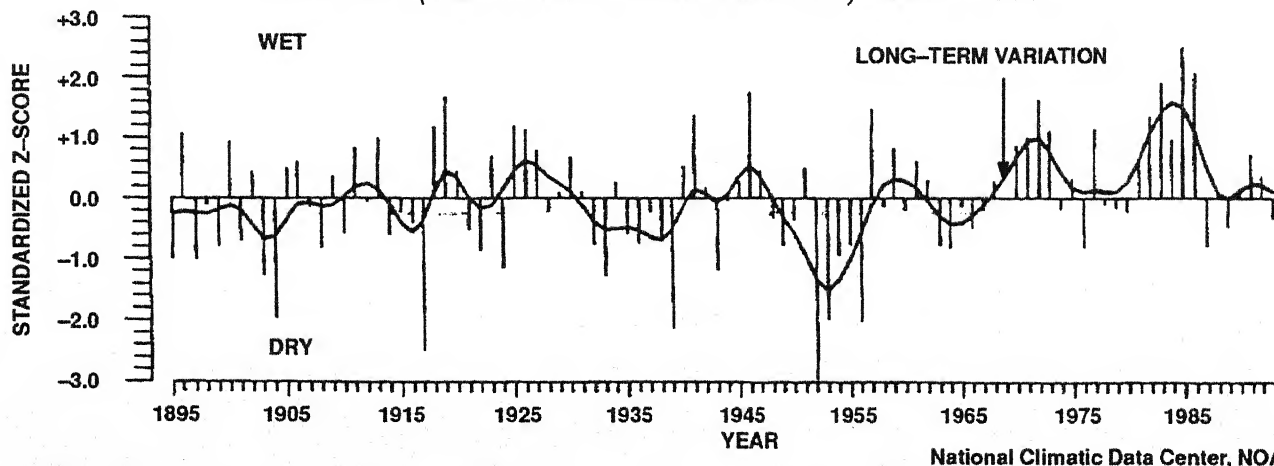


Based on preliminary data generated by the National Climatic Data Center

This chart depicts the ranking of the specific parameter, as measured during the period indicated, with respect to all other such periods on record since 1895.

U. S. NATIONAL NORMALIZED PRECIPITATION INDEX

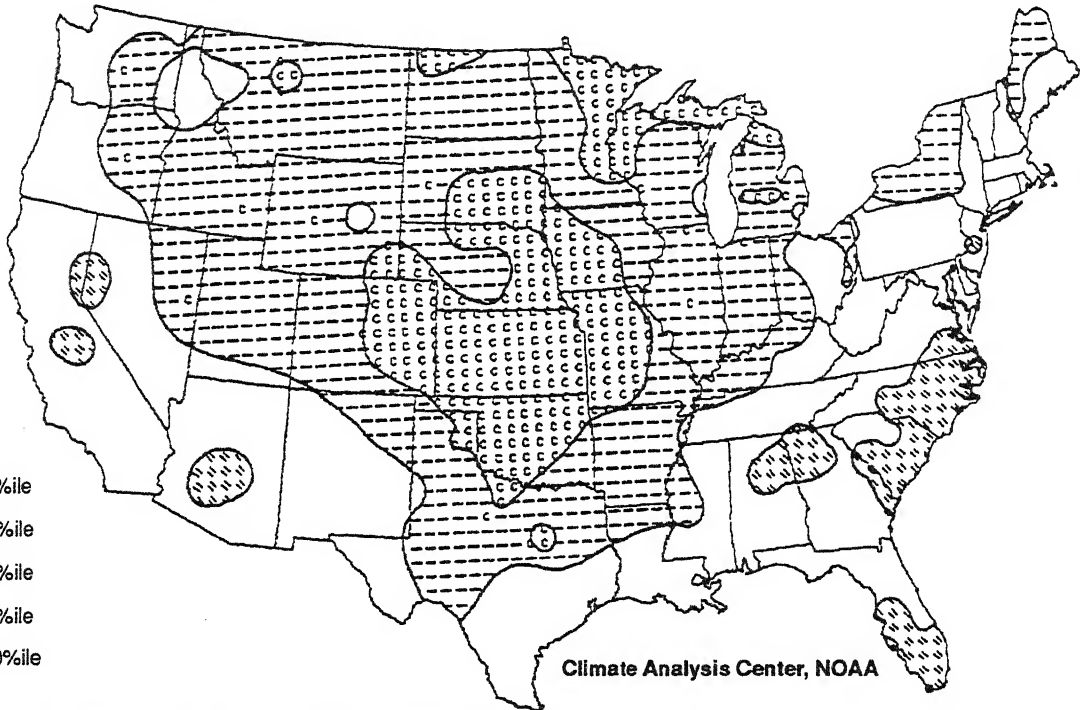
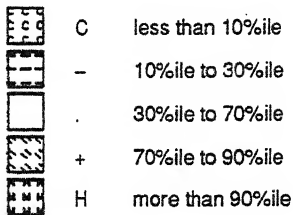
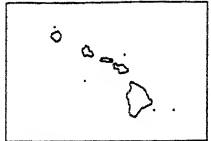
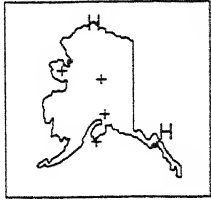
AUTUMN (SEPTEMBER – NOVEMBER) 1895 – 1993



NATIONAL MEAN AUTUMN (SEPTEMBER – NOVEMBER) 1895–1993 PRECIPITATION INDEX, as computed by the National Climatic Data Center. Autumn (September – November) 1993 was the 35th driest such season on record. This index takes local normals into account so that regions with large precipitation amounts do not dominate the index value.

TEMPERATURE PERCENTILES

AUTUMN (SEPTEMBER – NOVEMBER) 1993

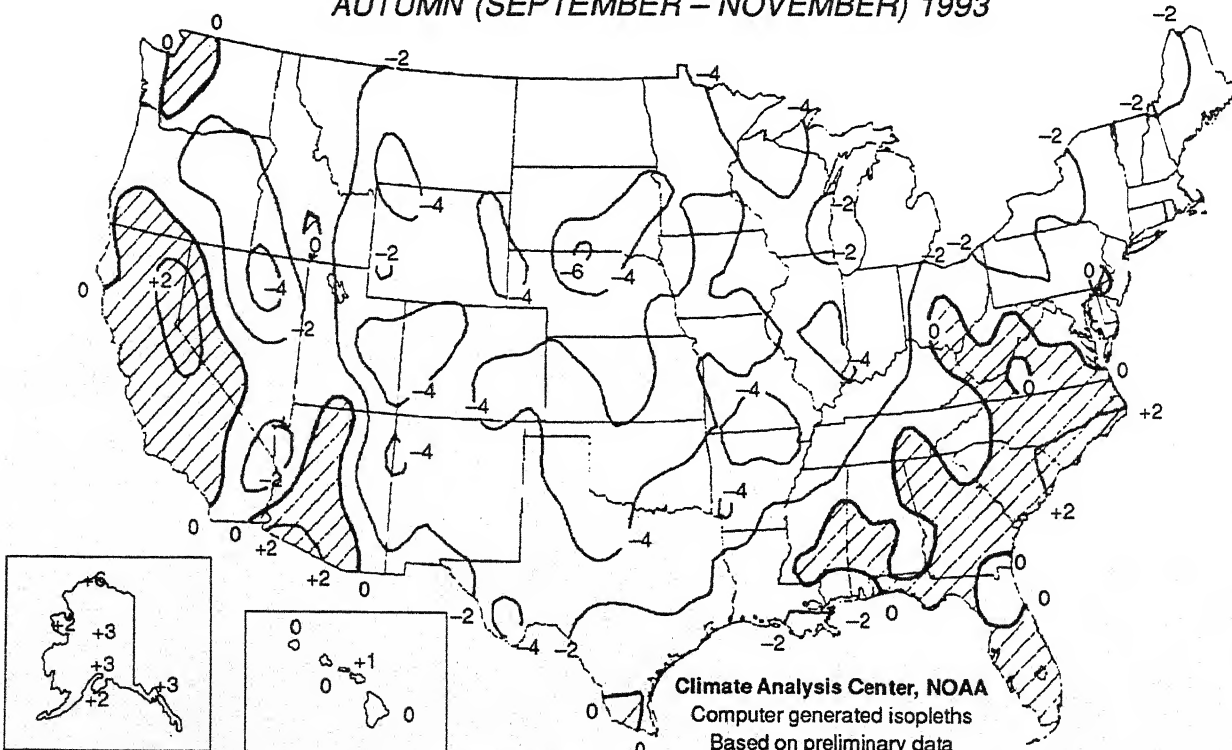


Climate Analysis Center, NOAA

AUTUMN (SEPTEMBER – NOVEMBER) 1993 TEMPERATURE PERCENTILES, as computed by the Climate Analysis Center. Unusually cold weather (<30%ile) covered most of the United States from the Great Basin eastward to the Ohio Valley and northeastward into New England, with seasonal mean temperatures among the coldest 10% of the 1961–1990 historical distribution across the central Great Plains and upper Great Lakes. Abnormally warm weather was limited to scattered portions of the Southwest, Southeast, and mid-Atlantic.

DEPARTURE OF AVERAGE TEMPERATURE FROM NORMAL (°F)

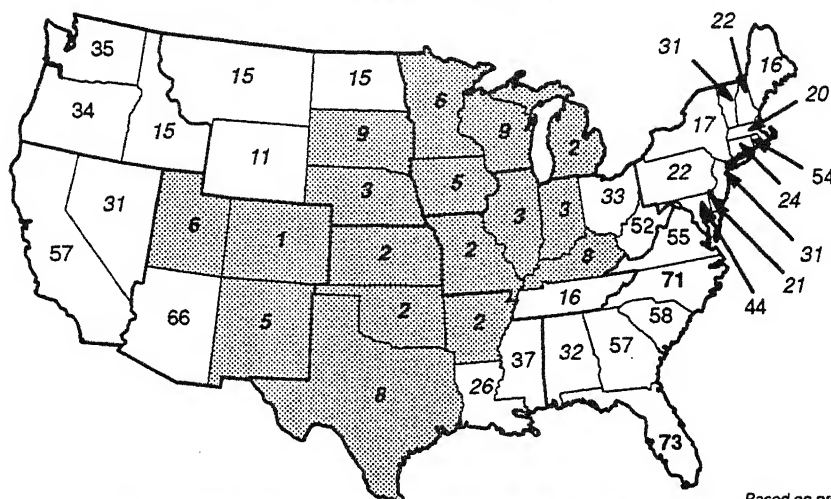
AUTUMN (SEPTEMBER – NOVEMBER) 1993



Climate Analysis Center, NOAA
Computer generated isopleths
Based on preliminary data

AUTUMN (SEPTEMBER – NOVEMBER) 1993 DEPARTURE OF AVERAGE TEMPERATURE FROM NORMAL (°F). Shaded areas experienced above normal temperatures. Temperatures averaged 2°F to 6°F below normal across much of the country from the Rockies eastward to the Appalachians, with the largest negative departures in Nebraska and South Dakota. Seasonal mean temperatures at least 2°F above normal were limited to the northern Sierra Nevada, extreme southwestern Arizona, and the Carolina Coast.

HISTORICAL TEMPERATURE RANKINGS BY STATE AUTUMN (SEPTEMBER – NOVEMBER) 1993



LEGEND

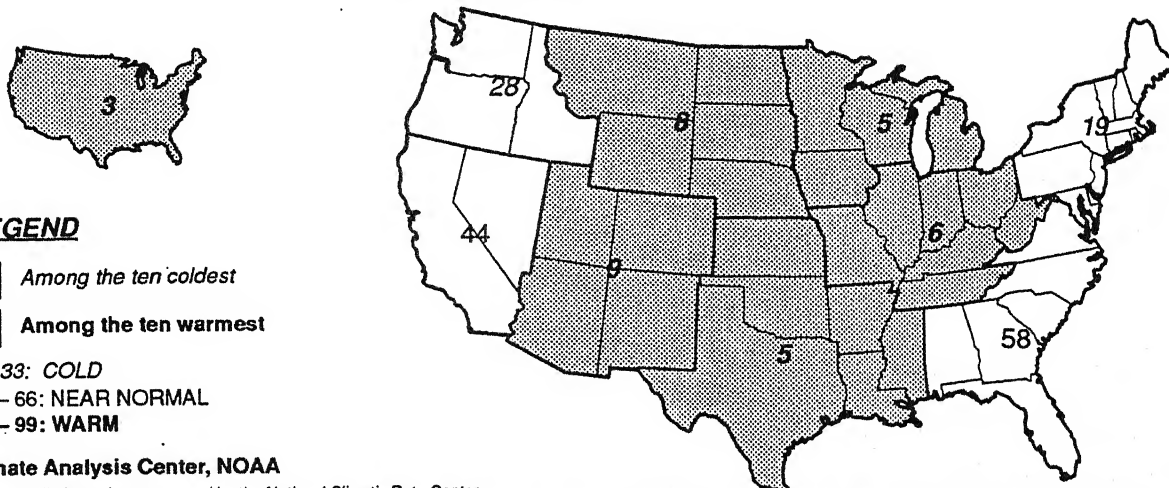
- Among the ten coldest
- Among the ten warmest
- 1 – 33: COLD
- 34 – 66: NEAR NORMAL
- 67 – 99: WARM

Climate Analysis Center, NOAA

Based on preliminary data generated by the National Climatic Data Center

This chart depicts the ranking of the specific parameter, as measured during the period indicated, with respect to all other such periods on record since 1895.

HISTORICAL TEMPERATURE RANKINGS BY REGION AND NATION AUTUMN (SEPTEMBER – NOVEMBER) 1993



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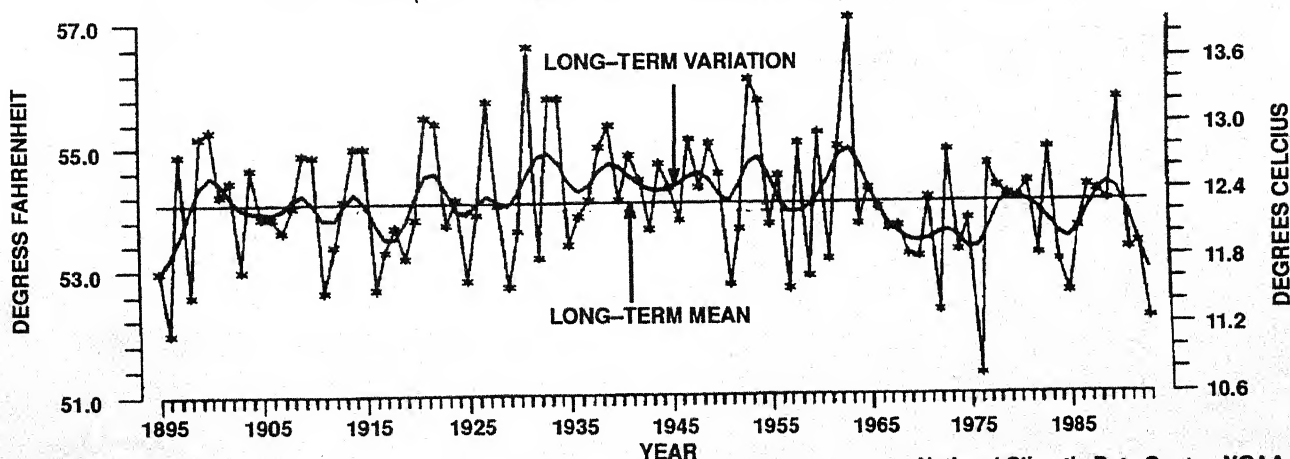
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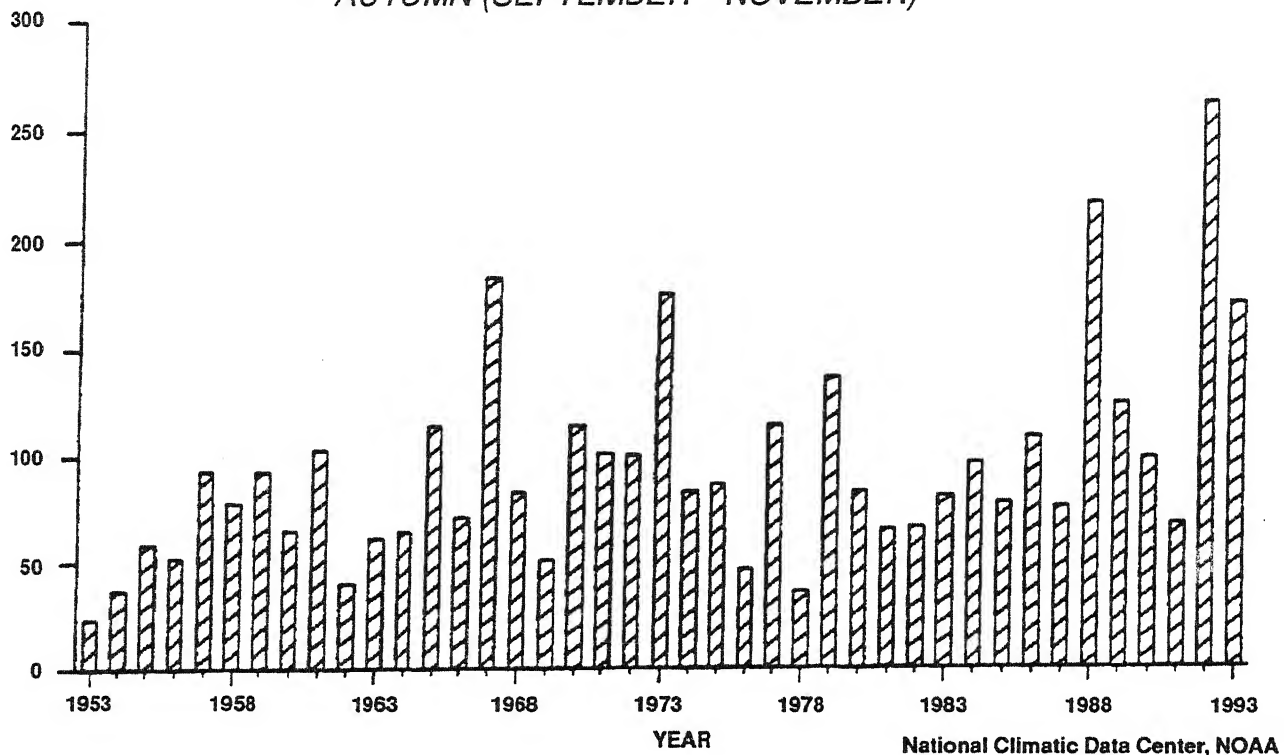
U. S. NATIONAL TEMPERATURE AUTUMN (SEPTEMBER – NOVEMBER) 1895 – 1993



National Climatic Data Center, NOAA

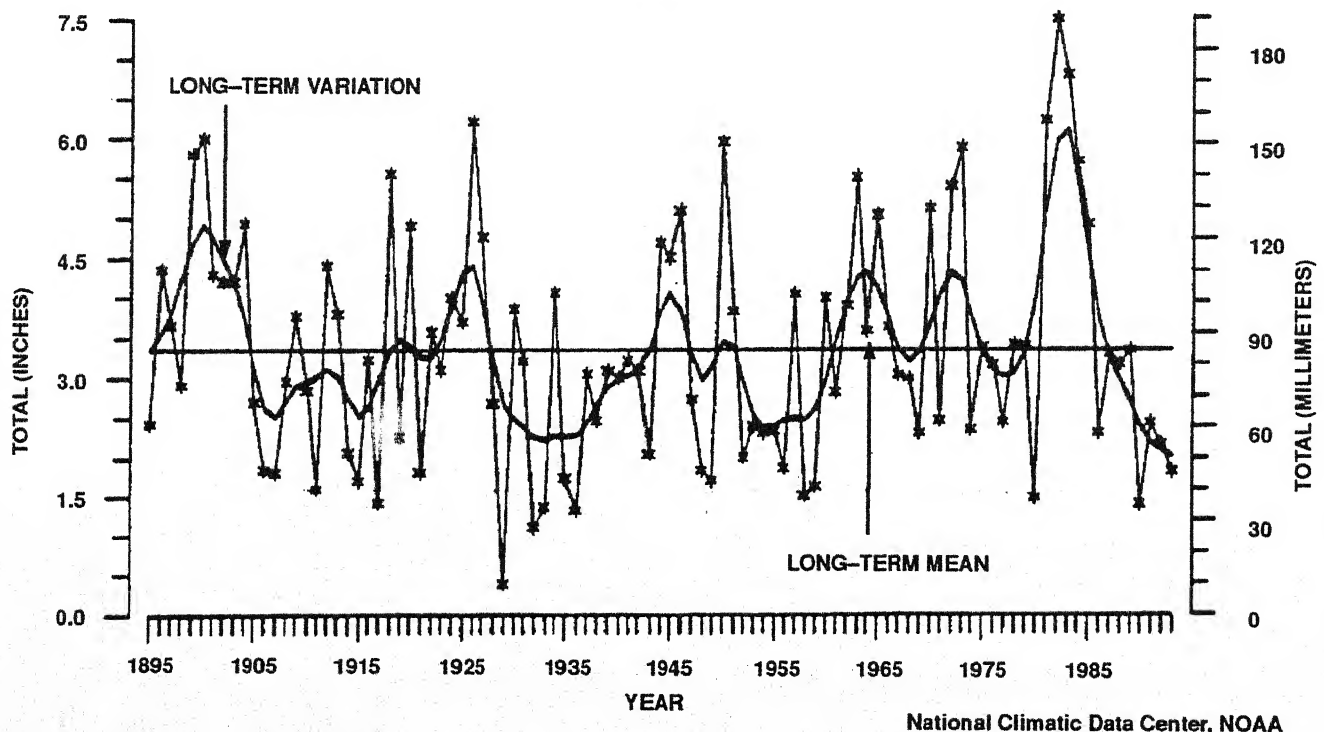
NATIONALLY AVERAGED AUTUMN (SEPTEMBER – NOVEMBER) 1895 – 1993 TEMPERATURES, as computed by the National Climatic Data Center. Autumn (September – November) 1993 was the coldest such season since 1976 and the 3rd coldest on record (since 1895). The index was dominated by an extensive area of submedian temperatures across most of the nation, especially throughout the central states.

NUMBER OF OBSERVED TORNADOES, U.S. AUTUMN (SEPTEMBER – NOVEMBER)



NUMBER OF OBSERVED TORNADOES IN THE UNITED STATES, AUTUMN (SEPTEMBER – NOVEMBER) 1953 – 1993, as compiled by the Climate Analysis Center. According to preliminary estimates, 169 tornadoes struck the country during Autumn 1993, compared with the 1953–1992 average of 92. The preliminary count, however, is generally 10% to 20% higher than the final official count.

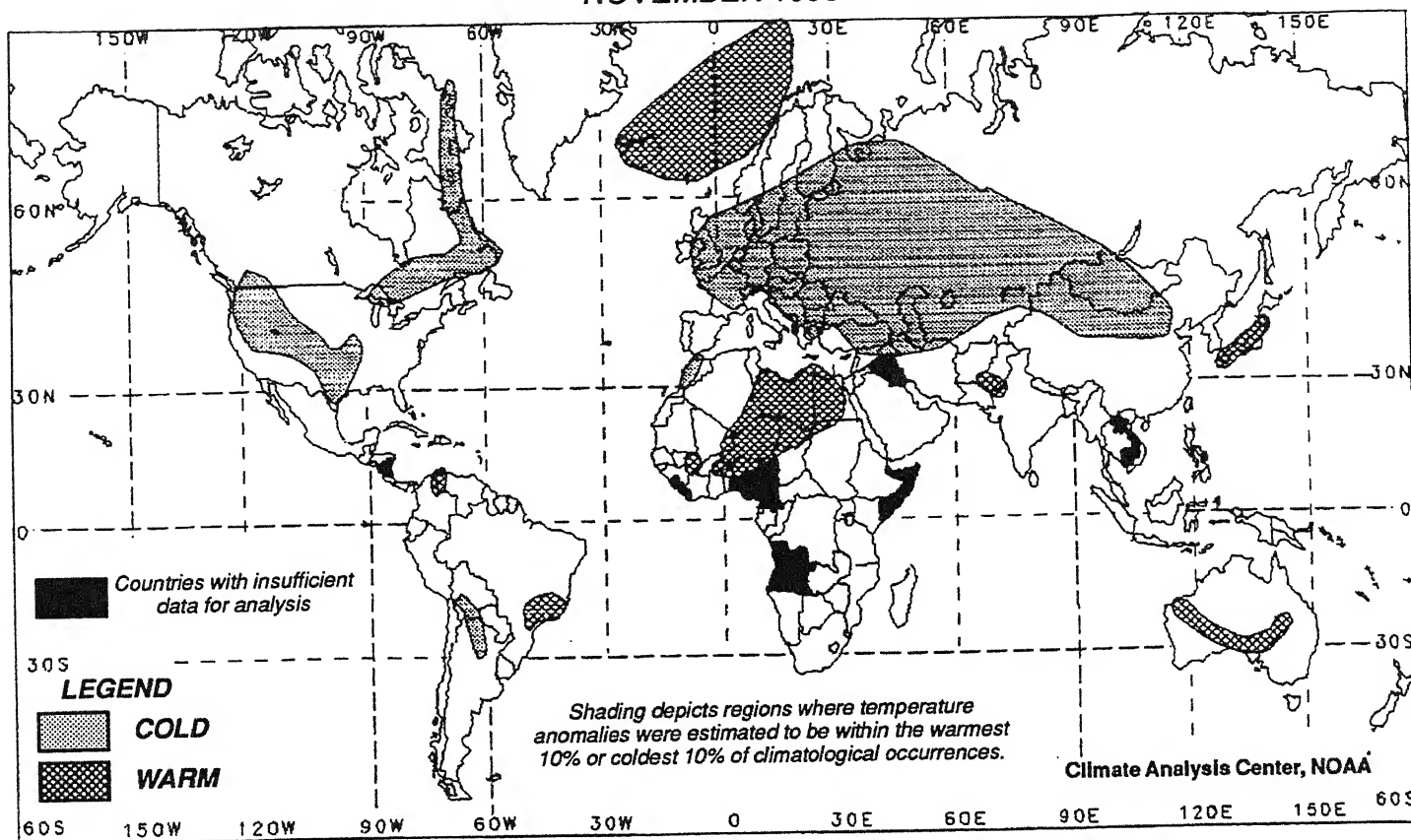
WEST REGION PRECIPITATION AUTUMN (SEPTEMBER – NOVEMBER)



WEST REGION AUTUMN (SEPTEMBER – NOVEMBER) 1895–1993 PRECIPITATION TOTALS, as computed by the National Climatic Data Center. Autumn is typically a time of increasing precipitation across the West Region, serving as a transition between the dry summer and wet winter seasons. Autumn (September – November) 1993 was the 8th consecutive such season with below normal precipitation in the West Region.

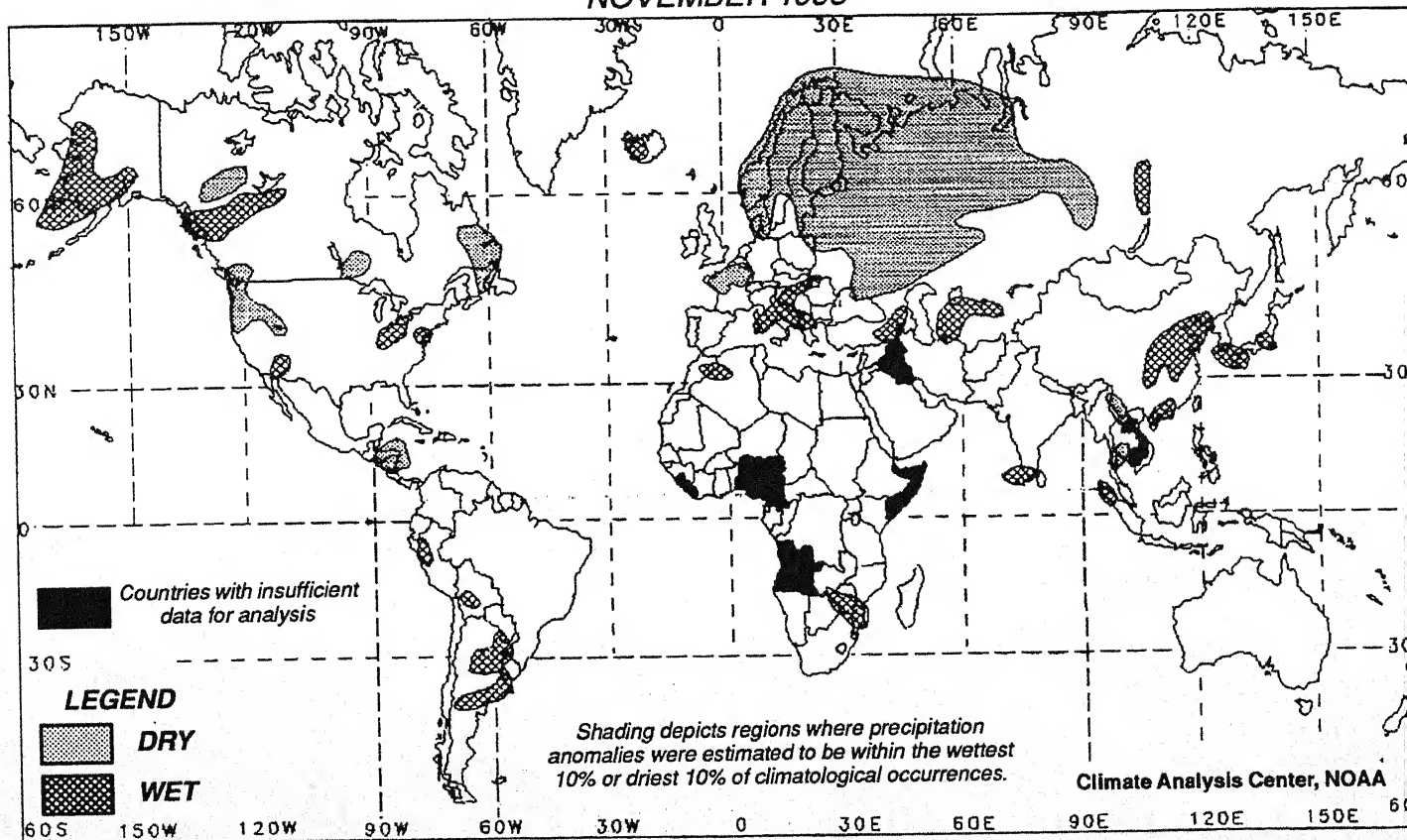
MONTHLY GLOBAL TEMPERATURE ANOMALIES

NOVEMBER 1993



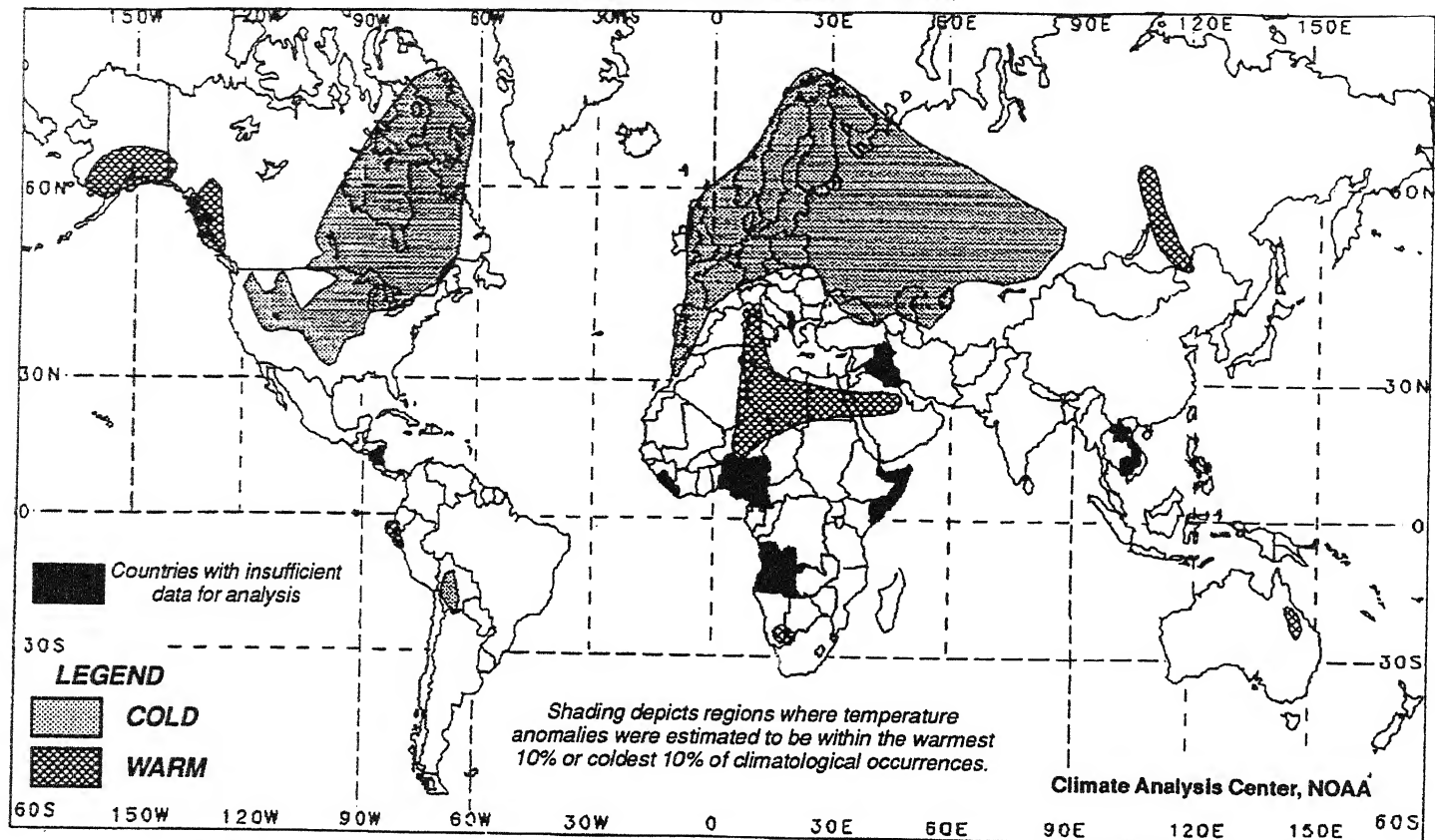
MONTHLY GLOBAL PRECIPITATION ANOMALIES

NOVEMBER 1993



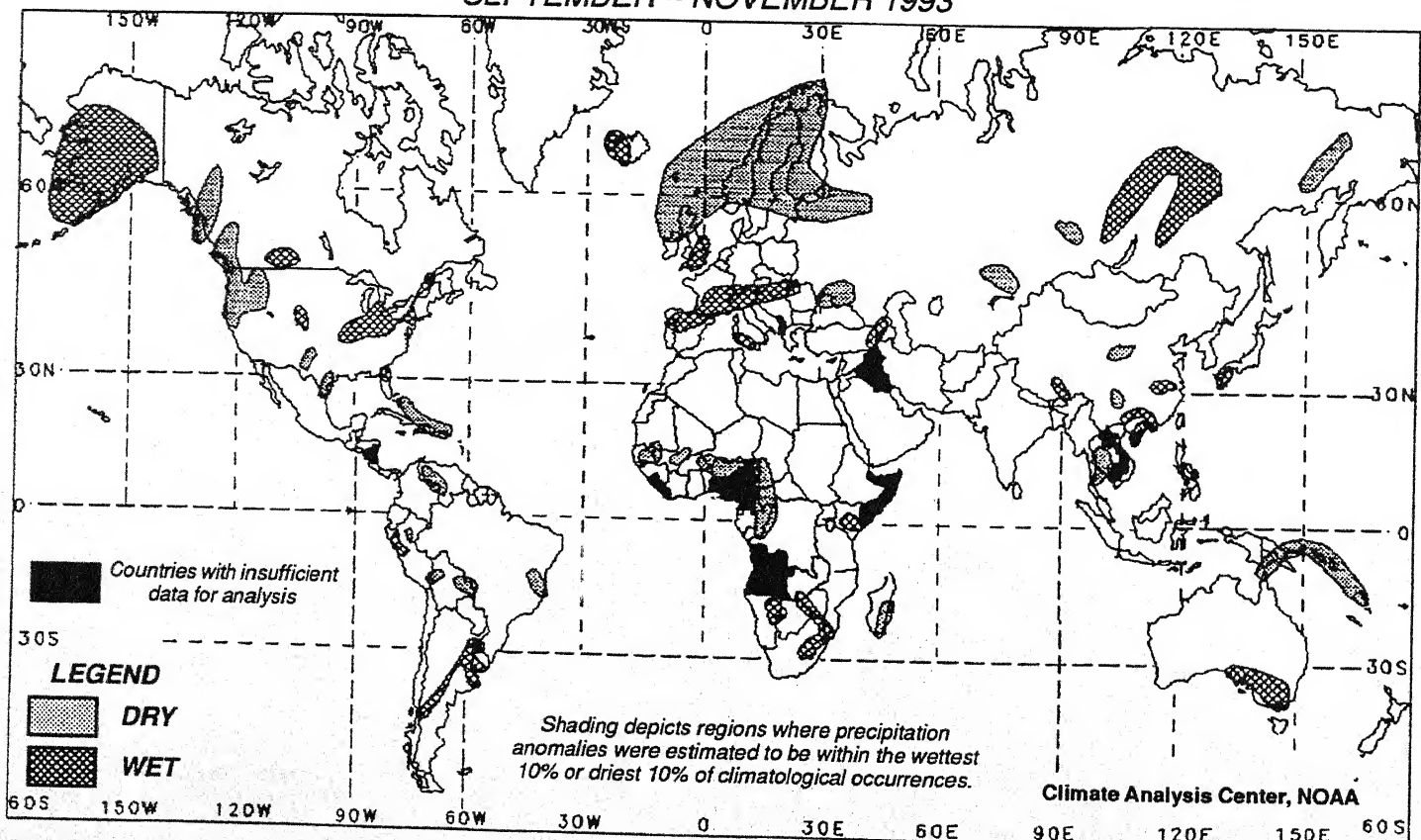
THREE-MONTH GLOBAL TEMPERATURE ANOMALIES

SEPTEMBER – NOVEMBER 1993



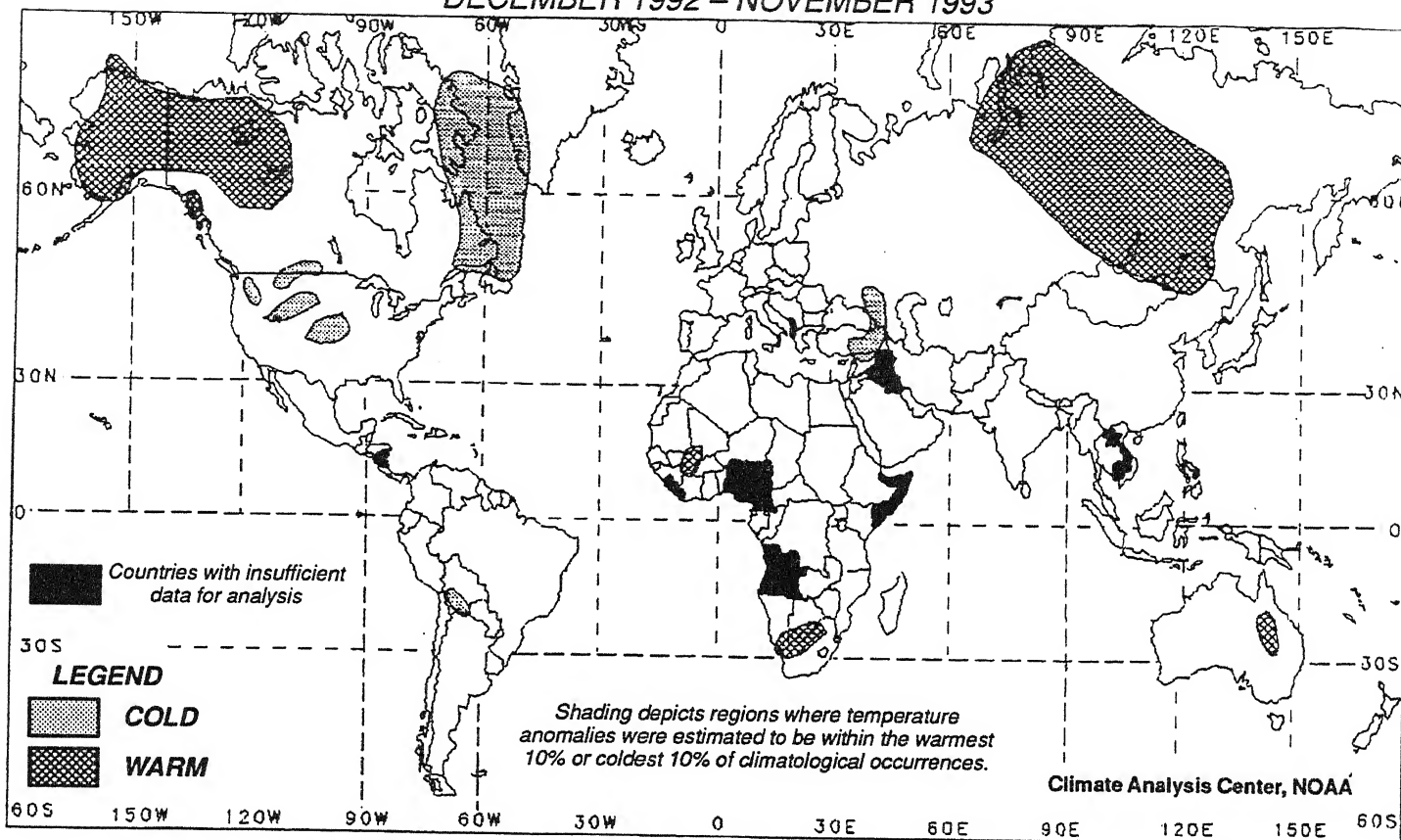
THREE-MONTH GLOBAL PRECIPITATION ANOMALIES

SEPTEMBER – NOVEMBER 1993



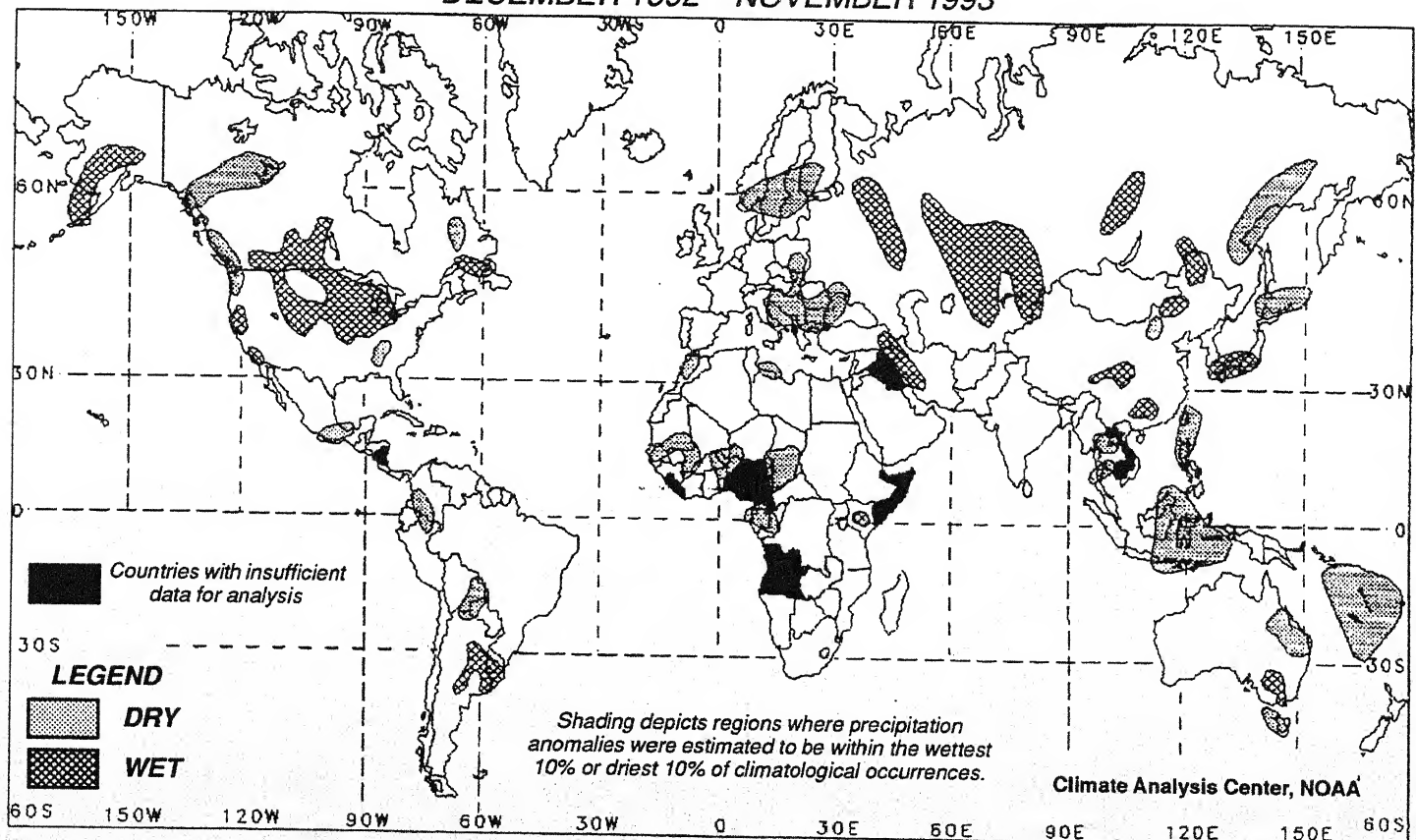
TWELVE-MONTH GLOBAL TEMPERATURE ANOMALIES

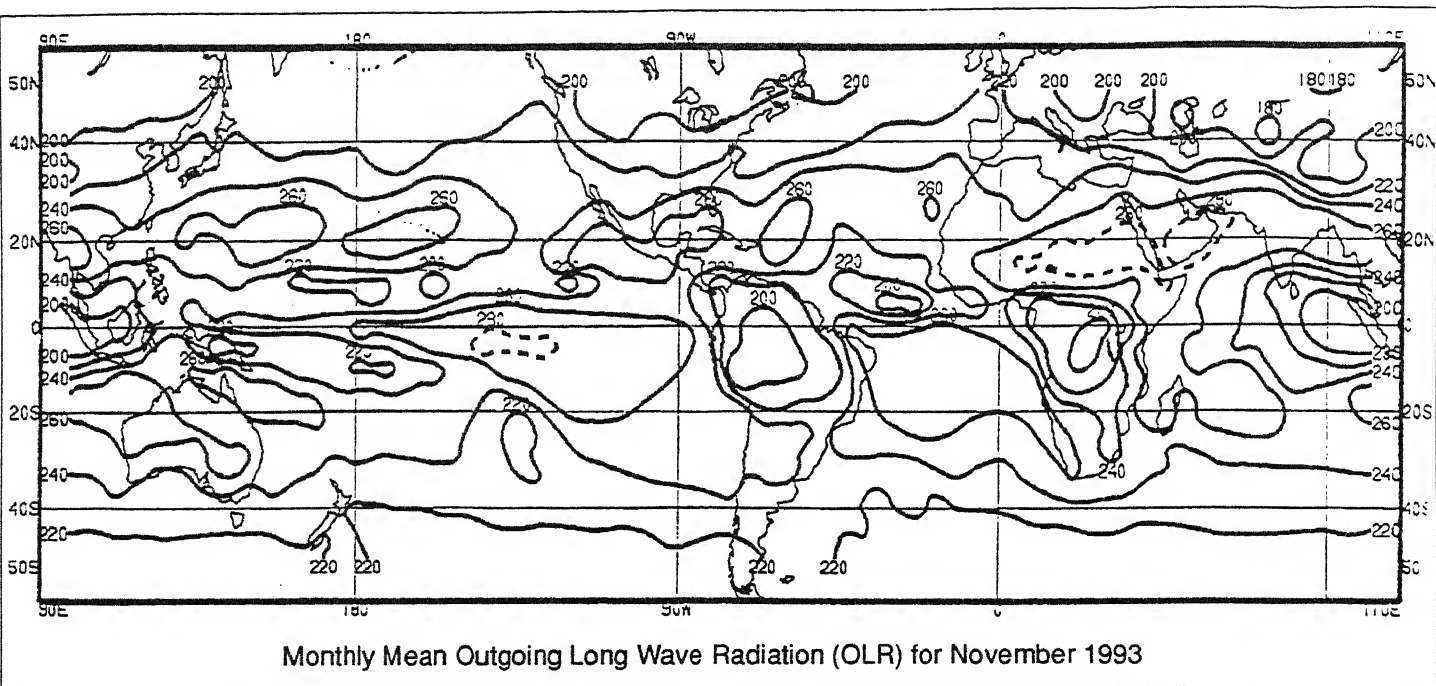
DECEMBER 1992 – NOVEMBER 1993



TWELVE-MONTH GLOBAL PRECIPITATION ANOMALIES

DECEMBER 1992 – NOVEMBER 1993





EXPLANATION

The mean monthly outgoing long wave radiation (OLR) as measured by the NOAA-9 AVHRR IR window channel by NES-DIS/SRL (top). Data are accumulated and averaged over 2.5° areas to a 5° Mercator grid for display. Contour intervals are 20 Wm^{-2} , and contours of 280 Wm^{-2} and above are dashed. In tropical areas (for our purposes $20^\circ\text{N} - 20^\circ\text{S}$) that receive primarily convective rainfall, a mean OLR value of less than 200 Wm^{-2} is associated with significant monthly precipitation, whereas a value greater than 260 Wm^{-2} normally indicates little or no precipitation. Care must be used in interpreting this chart at higher latitudes, where much of the precipitation is non-convective, or in some tropical coastal or island locations, where precipitation is primarily orographically induced. The approximate relationship between mean OLR and precipitation amount does not necessarily hold in such locations.

The mean monthly outgoing long wave radiation anomalies (bottom) are computed as departures from the 1979 - 1988 base period mean. Contour intervals are 15 Wm^{-2} , while positive anomalies (greater than normal OLR, suggesting less than normal cloud cover and/or precipitation) are dashed and negative anomalies (less than normal OLR, suggesting greater than normal cloud cover and/or precipitation) are solid.

